AMENDMENTS TO THE DRAWINGS

The drawings are objected to. The corrected drawings are attached, marked as Replacement Sheets.

REMARKS

Claims 1-127 are pending in the present application. Claims 1-127 are presently rejected.

Claim Rejections under 35 USC 103

Claims 1-27, 39-78, 90-110, and 120-127 are rejected under 35 USC 103(a) as being unpatentable over Kwon, US 6,519,045, in view of Johs et al. US 6,859,278.

Claims 28-38, 79-89, and 111-119 are rejected under 35 USC 103(a) as being unpatentable over Kwon and Johs et al., in view of Clementi et al., US 5,712,701.

REMARKS

Claims 1-27, 39-78, 90-110, 120-127 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,519,045 to Kwon in view of U.S. Patent 6,859,278 to Johs et al. The rejection is respectfully traversed.

The problem addressed by Kwon is described in column 1, lines 21-29. As stated by Kwon, the challenge faces by thin film metrology systems is that the gate oxide thickness changes over time due to the absorption of water and organic contaminate species referred to as organic compounds onto the wafer surface following growth of films or thermal treatment of the wafer. As explained in column 2, line 38 to column 3, line 19 and Figs. 1 and 2 of Kwon, undesirable organic compounds can be removed by baking the wafer at approximately 300° centigrade for about five minutes, but the layer grows back relatively quickly. As illustrated in Fig. 2 of Kwon, the oxide thickness of a silicon dioxide layer on a wafer, following a five minute heating step to remove organic compounds, has a flat region from the onset of measurements for approximately three minutes, after which the measured thickness increases monotonically. There is thus a three minute "window" noted in Fig. 2 during which the thickness of the gate oxide is stable and suitable for measurement. This window may be too short for metrology measurements. Stated by Kwon, "the present invention exploits this characteristic as discussed further below." Column 3, lines 18-19.

Kwon then explains a solution in column 3, line 44 through column 4, line 22. In such section, Kwon describes four different methods as possible solutions. All four methods have the commonality of removing the source of the organic compounds from the wafer surface in order to extend the time period in the window during which the thickness of the gate's oxide remains stable. In other words, Kwon seeks to extend the three minute window to a longer time period up to tens of minutes to provide adequate time for measuring the gate thickness while it is stable.

In the first method, Kwon encloses the measurement stage in an atmosphere such as nitrogen where the enclosure includes a transparent window through which thin film metrology tool as shown in Fig. 4 of the measurement system 8 makes measurements. The inert gases flow into the enclosure. The enclosure is constructed to allow the inert gas to exit the enclosure, carrying with it any moisture and organic compounds that may be present. A second method is to implement the optional inert atmospheric system by including a temporary storage site for one or more wafers after they have been heated. A third method is to enclose the surface in the heating station on which the wafer is heated and the inert gas is flowed through this enclosure to accelerate the rate at which organic compounds are removed. A fourth method is to provide a vacuum chamber in which the wafer is measured. A vacuum pump evacuates the chamber so that the deposition rate of any organic compounds in the chamber is minimal.

As can be seen from the above, the primary concern of Kwon is to remove the source of contaminants of the organic compounds. The problem sought to be resolved by the rejected claims are entirely different from Kwon. In claim 1, radiation with at least one vacuum ultraviolet ("VUV") wavelength component is used to detect characteristics of a sample. The amount of ambient absorbing gases and moisture present in at least a portion of each of the illumination and detection paths of radiation is reduced by displacing such gases and moisture with another gas that does not substantially absorb the at least one VUV wavelength component so as to reduce attenuation of the VUV wavelength components. As noted on pages 1 and 2 of the specification of the present invention, the shrinking of semiconductor devices to smaller and smaller sizes imposes much more stringent requirements on the sensitivity of wafer inspection instruments which are called upon to detect contaminant particles pattern defects as well as defects of the surfaces that are small compared to the size of the semiconductor devices. One approach to approve the sensitivity of metrology measurements is to employ radiation of shorter

wavelengths such as VUV wavelengths in the range of 140 to 180 nanometers. Unfortunately, however, these short wavelengths do not propagate in oxygen over an appreciable distance, so that in conventional systems, this requires that the metrology system be placed in a vacuum, or in an inert environment such as nitrogen or argon. For this reason, such radiation is referred to as vacuum ultraviolet ("VUV") radiation. Such conventional systems are expensive and typically have low throughputs, thus not suitable for manufacturing.

The invention of rejected claim 1 overcomes this drawback by simply reducing the amount of ambient absorbing gases and moisture present in the measurement by displacing the absorbing gases and moisture with another gas that does not substantially absorb at least one VUV wavelength component.

From the above, it can be observed that problem sought to be solved by rejected claim 1 is entirely different and has nothing to do with the concern of Kwon.

While Kwon uses an inert gas that happens to have the property of not significantly absorbing VUV wavelength components, nitrogen is chosen by Kwon only for its inert property of not containing organic compounds or moisture that would change the thickness of the gate oxide, and not because of any of its radiation absorption or other spectroscopic properties. The fact that Kwon is utterly unconcerned with the light absorption properties of the inert atmosphere he uses is exemplified by claim 3 of Kwon in which it is stated that "wherein said inert atmosphere is selected from the group consisting of an inert gas, chemically filtered air, dry air and a vacuum." Thus in Kwon's view, the following four elements all have the same required properties for an inert atmosphere that will serve the purpose of Kwon: inert gas, chemically filtered air, dry air and vacuum. As explained in the specification of the present invention, VUV wavelength components do not propagate in air over an appreciable distance. See paragraph 7. Thus in claim 1, it is clearly stated that the amount of ambient absorbing gases (which includes air) is reduced by displacing such gases with another gas that does not substantially absorb the at least one view wavelength components.

From the above, it is clear that certain embodiments (those that use air) of Kwon actually teach away from the invention of rejected claim 1, namely, the displacement of ambient absorbing gases by a gas that does not substantially absorb VUV wavelength components.

MPEP 2141.02 requires that prior art must be considered in its entirety, including disclosure that teaches away from the claims. Thus the Examiner cannot ignore the disclosure in Kwon such as in claim 3, that teaches away from the rejected claims.

While the Examiner admits that Kwon does not explicitly teach the use of VUV radiation for measuring samples, in the Examiner's opinion, such feature is known as taught by Johs. According to the Examiner, "it would have been obvious to one having ordinary skill in the art at the time the invention was made to replace the light source of Kwon by a VUV light source taught by Johs et al. because they function in the same manner. A substitution one for another is generally recognized as being within the level of ordinary skill in the art." We disagree.

First, there is a huge difference between the use of UV versus that of VUV radiation for sample measurement, so that teaching the use of one does not necessarily suggest the use of the other. UV radiation can propagate in air and therefore used for measuring samples without requiring any special environment, whereas VUV radiation requires either a vacuum chamber or one with purged gas in conventional schemes. In view of the above, the fact that Kwon mentions the use of UV radiation does not suggest the use of VUV radiation for measurement. While Johs discloses the use of VUV radiation for metrology, Johs' metrology system requires the use of a vacuum chamber, which means that Johs' system is no different from that described in paragraph 7 in the background of the invention of the present application on page 2. As noted above, such systems typically have low throughput and are not suitable in manufacturing monitoring.

As also noted above, the use of an inert gas is only one of four different alternatives outlined by Kwon as further illustrated in claim 3 of Kwon. The reason or motivation provided by the examiner to one of ordinary skill in the art to replace the light source of Kwon by a VUV light source of Johs is "because they function in the same manner." In order for the VUV light source taught by Johs to function in the same manner as in Kwon, this means that all of the four alternatives described by Kwon, only the one employing a vacuum chamber would fit the rationale of the Examiner. In other words, only the method using a vacuum chamber as described by Kwon would work in the same manner when the light source of Kwon is replaced by a VUV light source. This combination of Kwon and Johs does not render claim 1 obvious, since this combination fails to teach or suggest the limitation in claim 1 of "reducing amount of ambient absorbing gases and moisture present in at least a portion of each of the illumination and

detection paths by displacing said gases and moisture with another gas that does not substantially absorb the at least one VUV wavelength component so as to reduce attenuation of the at least one VUV wavelength component."

The combination intended by the Examiner is apparently to replace the light source of Kwon by a VUV light source of Johs while retaining the use of an inert atmosphere in Kwon. It is submitted that there is no reason or motivation for such intended combination of the Examiner. As noted above, the inert gas such as nitrogen is selected by Kwon only for its property that it does not contain the organic compounds. This criteria can be met by many different gases, including those that will absorb VUV radiation, such as dry air and chemically filtered air as specified in claim 3 of Kwon. Given such purpose of the inert atmosphere as described by Kwon, there is no reason or motivation for combining the use of nitrogen in Kwon with the VUV light source of Johs et al. The much more natural combination would be to select, from the four methods described by Kwon, the vacuum chamber alternative in combination with VUV radiation of Johs. If the Examiner disagrees, it is respectfully requested that the Examiner set forth in detail the reasons for such combination, and provide factual support for such reasoning in Kwon or in Johs or both.

MPEP 2141.02 requires that prior art must be considered in its entirety, including disclosure that teaches away from the claims. Thus the Examiner cannot ignore the disclosure in Kwon, such as that in claim 3, that teaches away from the rejected claims, and select only the part of Kwon that favors his position.

From the above, it is submitted that the Examiner has failed to provide a *prima facie* case of obviousness in rejecting claim 1. Claim 1 is therefore believed to be allowable. For substantially the same reasons as those explained above for claim 1, claim 53 is also believed to be allowable.

In claim 121, the amount of ambient absorbing gases and moisture present in illumination and detection paths of VUV radiation is reduced by displacing the gases and moisture with another different gas that contains less oxygen and moisture than those in an atmosphere surrounding an envelope enclosing the optics and detector. The apparatus of claim 121 further comprises means for shielding an opening in the envelope from the atmosphere to enhance laminar flow of the gas through the opening. Kwon simply contains no disclosure of such

shielding means. In fact, the apparatus described by Kwon is highly conceptual and contains no details at all, as exemplified by its apparatus shown in Figs. 3 and 4. There is simply no element described by Kwon that corresponds to the shielding means of claim 121. The Examiner has likewise failed to address this particular feature in claim 121. Claim 121 also contains a limitation similar to that of claim 1 described above. Thus for the same reasons as those explained for claim 1 and for the additional reason that Kwon and Johs fail to teach or suggest the shielding means of claim 121, claim 121 is believed to be allowable. Claim 125 is believed to be allowable for substantially the same reasons as those explained above for claim 121. If the Examiner disagrees, it is respectfully requested that the Examiner set forth in detail the basis for rejecting claims 121 and 125, including exactly where the teachings for the shielding means can be found in Kwon or Johs, and provide reasons and motivation for any combination of Kwon and Johs intended to be used by the examiner.

Claims 2-49 are believed to be allowable since they depend from allowable claim 1. They are further believed to be allowable on account of the further limitations in these claims. Thus claim 50 contains the limitation that the opening is within 1 cm from the surface. Claim 51 contains the limitation that the sample is outside of the envelope 20 during illuminating, collecting, reducing and detecting. Such limitations are not taught or suggested by Kwon or Johs. As noted above, the disclosure for Kwon is highly conceptual and contains no disclosure on the details of his apparatus. The Examiner has failed to address the limitation of claim 50.

Claims 54-120, 122-124 and 126-127 are believed to be allowable since they depend from allowable claims. They are further believed to be allowable since they contain limitations which are not taught or suggested by any art of record.

Regarding claims 101-109, the Examiner rejects these claims on the ground that "it would have been a matter of design choice to choose the dimensions, shape, size of the hole so that it is suitable for the designed device." We disagree. We believe that design choice is not a proper basis for rejecting claims. The Examiner is respectfully requested to supply the proper basis for rejecting these claims.

Regarding claims 123, 124 and 127, the Examiner is of the opinion that it would have been obvious to include in Kwon a shielding means between the sample and the envelope since such shielding means would prevent the ambient light or unwanted light to enter the detection

system, thus increasing the signal to noise ratio. We disagree. As clearly spelled out in claim 121, the purpose of the shielding means is to enhance the laminar flow of the gas through the opening of the envelope, and has nothing to do with shielding of ambient light or unwanted light that may enter the detection system. Kwon simply contains no disclosure on any means for shielding at any opening to enhance laminar flow of the gas through the opening. There is thus no basis for the Examiner's rationale. Kwon fails to teach or suggest the features in claims 124 and 127. In claim 124, for example, the obstruction is adjacent to or in contact with an outside surface of the envelope which is simply not in a position to shield any unwanted or ambient light from the detection system. The same is true for claim 127. The rationale provided by the examiner is invalid with respect to claims 124 and 127.

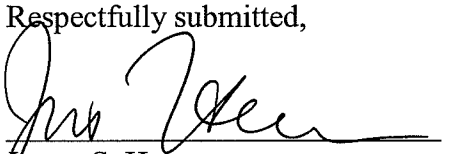
Claims 28-38, 79-89, 111-119 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon and Johs and further in view of U.S. Patent 5,712,701 to Clementi et al. The rejection is respectfully traversed. Since Clementi fails to remedy the above-described deficiencies of Kwon and Johs, the combination of Kwon and Johs and Clementi, even assuming that there was reason or motivation for the combination, fails to teach or suggest the independent claims 1 and 53. Therefore claims 28-38, 79-89, 111-119 are also believed to be allowable over the three references either in combination or individually since they depend from allowable claims 1 and 53.

CONCLUSION

In view of the amendments and remarks contained herein, it is believed that all claims 1-127 are in condition for allowance and an indication of their allowance is requested. However, if the Examiner is aware of any additional matters that should be discussed, a call to the undersigned attorney at: (415) 318-1162 would be appreciated.

FILED VIA EFS

Respectfully submitted,



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